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NONDESTRUCTIVE EVALUATION (NDE) TECHNOLOGY INITIATIVES PROGRAM (NTIP)

Delivery Order 0043: Upgrade of Computed Tomography Facility

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MATERIALS AND MANUFACTURING DIRECTORATE
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14. ABSTRACT

The two aging CT systems in Building 71 at Wright-Patterson AFB were analyzed to determine the current state of computer and other hardware, and to define an upgrade plan to improve supportability and enhance system performance. The Tomoscope CT system became the focus of the project. The Tomoscope gantry control computer was a Compaq 386-processor-based PC, which included several one-of-a-kind processor boards. The gantry control interface module included aging wire-wrap boards. The gantry motors and stages were manufactured by a now defunct company, making repair and support difficult. The gantry control computer, gantry control software, gantry control module, gantry motors and gantry stages were all replaced. The new system utilizes a software motor control system linked to digital motor amplifiers through a FireWire connection. The control system is accessed through custom software that fully duplicates the functionality of the former gantry control software, including replicating the exact interface with the Tomoscope scan control system. The new hardware and software were installed and tested. System reliability and supportability has been significantly improved.

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PROJECT SUMMARY

This report details the work performed, findings and conclusions achieved under Air Force Contract F33615-97-D-5271, Delivery Order 0043, Subcontract 03-S437-043-C1. The program objectives were to analyze, identify and replace obsolete hardware and software on the Tomoscope CT system; and to analyze and identify necessary spares for the LAMDE CT system. The project goals were known to exceed available funds and schedule. Work on the upgrade plan formulated in this program will continue under Air Force Contract No. F33615-98-C-5217. This report will provide a summary of the work performed. A detailed final report will be provided under Air Force Contract No. F33615-98-C-5217.

The first stage of the project identified potential reliability and performance improvements to the LAMDE CT system. Recommendations were made for a low cost augmentation of the resolution capability by using a source side aperture to effectively reduce the x-ray source spot size. A method for archiving data was also added that will allow for efficient retrieval and backup of historical data and more reliable long-term storage of data. Other components of the LAMDE CT system were identified as areas of concern; however, because of their interconnected nature, upgrades to portions of the machine would prove to be cost prohibitive. The best way to achieve long-term reliability is to have adequate spares of critical components. ARACOR will continue to be diligent about obtaining spares of high-risk portions of the LAMDE subsystems on a proactive basis.

An analysis of the Tomoscope system identified the gantry control computer, gantry control software, gantry control electronics, motors and stages as the subsystems meriting the highest priority for the upgrade program. Supportability was a major concern for each of these subsystems. The Tomoscope gantry control computer was a Compaq 386-processor-based PC, which included several one-of-a-kind, wire-wrap processor boards. The gantry control interface module also included aging wire-wrap boards. The gantry motors and stages were manufactured by a now defunct company, making repair and support difficult.

The Tomoscope gantry control computer, gantry control software, gantry control module, gantry motors and gantry stages were all replaced. The new system utilizes Aerotech's software motor control system linked to digital motor amplifiers through a FireWire connection. The software resides on a modern PC running the Windows XP operating system. The control system is accessed through software that fully duplicates the functionality of the former gantry control software, including replicating the exact interface with the Tomoscope scan control system. The software was written in Visual Basic to allow maximum future supportability.

The new hardware and software have been installed and tested. The new Tomoscope gantry system has improved positional accuracy over the original gantry. This should lead to improved image quality in the CT data. System reliability and supportability has been significantly improved.

A second phase of upgrades to the Tomoscope has been identified and planned. The next phase will include replacing the scan control computer (an IBM RS6000) and the image analysis computer (an SGI Impact 10000). The functionality of these two computers can be hosted on the new computer used for gantry control. While the replacement of these subsystems was a lower priority than the replacement of the gantry system, ARACOR recommends that the replacement proceed as soon as possible.